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Enhancing Exposure Therapy for Specific Phobias Using a Pre-Treatment Fear Priming Task

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Enhancing Exposure Therapy for Specific Phobias Using a Pre-Treatment Fear Priming Task

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Dedication

I would like to dedicate this thesis to my family, friends, and fiancé, who have always supported me.

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I would like to thank Dr. Michael Telch and Dr. Marie Monfils for this help with this project. I would also like to thank my team of research assistant for their assistance with data collection.

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Recent animal and human research suggest that a behavioral prime before extinction training lessen the spontaneous recovery of learned fear. These findings would have large ranging implications if they could be applied to the treatment of specific phobias in which spontaneous recovery is often problematic. The present study examined the effects of a behavioral prime paired with exposure therapy versus exposure therapy alone on snake and spider phobics return of fear at one-month follow-up. The findings did not support the proposed hypothesis that those in the primed group would show a significant lessening in return of fear. The study findings do not support the current research, but there were a number of steps that may be taken in the future to gain more objective measurements.

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Introduction

Exaggerated or persistent fear is a common occurrence in psychiatric disorders. Anxiety disorders represent one of the most commonly diagnosed disorders, with a 31% lifetime prevalence (Kessler, et al., 1994). The overall economic burden of anxiety disorders through both direct and indirect costs average approximately 42.3 billion dollars per year (Greenberg, et al., 1999). Without treatment, these disorders tend to have a chronic course with a low rate of spontaneous remission. Specific phobias represent one of the most commonly occurring disorders with a lifetime prevalence of about 11% (Kessler, et al. 1994). These rates climb even higher when one considers subclinical presentations (Birchall, 1996). Paradoxically, few patients present at anxiety clinics for specific phobia treatment as a primary diagnosis (Barlow, et al., 1986, Kessler, Zhao, et al., 1999 Antony, 2000). These patients live with the disorder, despite the relatively short time investment it takes to treat it. In the present study, we examine populations with significant arachnophobia or ophidiophobia.

Arachnophobia and ophidiophobia both fall under the specific phobia umbrella of animal phobia, which is one of the most commonly occurring specific phobias (Curtis, et al., 1998). Animal phobias tend to have onset in childhood (Antony, et al 1997; Ost,1987; Marks & Gelder, 1966; Himle, et al., Craske, Burton, et al., 1989). Women are also more likely to experience these fears than men (Fredrikson, et al., 1996). In addition or in lieu of fear, those with animal phobias, in particular snakes and spiders, may experience disgust specific to the stimulus as well. (Thorpe & Salkovskis, 1998). While fear is the primary construct of a phobia, disgust can be an important co-variable in treatment

outcome. The accepted "gold standard" method of treatment for animal phobias is exposure therapy.

The efficacy of exposure-based treatments for specific phobias has been well established (Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008). However, studies on the long term maintenance of the gains of anxiety treatment are lacking. Rachman posits that a number of individuals experience return of fear after successful treatment due to "some form of disturbance, in consolidation, or dishabituation, or both" (1989). Return of fear is the process by which an extinguished fear experiences spontaneous recovery in the time period between the end of evaluation and follow-up treatment. This return of phobic behavior has been reported in multiple studies (Craske, 1999, Rachman 1989), including one in which 62% of responders showed a return of signs of clinically significant avoidance, and 45% showed a return of clinically significant symptoms of their specific phobia (Lipsitz, et al., 1999). Therefore, it is necessary to pioneer methods to reduce the return of fear after extinction. This will help to increase the long-term efficacy of specific phobia treatments and decrease the associated costs for follow-up treatment to maintain treatment gains.

Recent research in the field of memory has suggested a possible manipulation to reduce return of fear. Reconsolidation is the process of once again consolidating memories after they have been actively recalled. After recall, memory must be reconsolidated or it will be forgotten. Reconsolidation involves neural processes that are similar to those in consolidation. During reconsolidation, the memory enters a labile

state in which changes to the already encoded memory are possible. This period of instability is known to persist for several hours following memory retrieval. In contrast, fear extinction leads to the weakening of an emotional response, not by direct modification of the existing memory, but by formation of a new memory that suppresses activation of the initial memory. The efficacy of this inhibition, however, is strongly contingent upon spatial, temporal, and sensory variables (Mineka, Mystkowski, Hladek, and Rodriguez, 1999).

Previous work in animal models demonstrates that the administration of protein inhibitors successfully enables reconsolidation blockade. However, utilizing this technique in human models presents a multitude of challenges. Protein synthesis blockade requires direct administration of the inhibitors to the brain (Nader, 2003). This is an invasive procedure and unethical to conduct in humans. Additionally, application of protein synthesis inhibitors is imprecise because current methodologies lack the ability to chemically target human memories without causing damage to structures within the brain. However, recent work suggests that use of a behavioral priming technique may be an efficacious alternative for re-encoding previously consolidated memories (Monfils, et al, 2008; Schiller, et al. 2008).

In preliminary trials, fear-trained rat and human participants were primed with an isolated retrieval trial of their feared stimulus. After a critical time period had passed, researchers administered extinction training. Both rats and humans that experienced this fear prime followed by a delay before extinction training exhibited reduced fear

expression and a significant reduction in return of fear at follow-up (Monfils et al., 2008; Schiller et al., 2008). This critical time period is known as the lability window and remains open between ten minutes and six hours after the original memory's priming (Nader, Schafe, & LeDoux, 2000)

. The current study hopes to devise an effective, drug-free paradigm for the reduction of return of fear. It capitalizes on the mechanistic differences between reconsolidation and extinction, thus not only providing extinction training, but also manipulating the previously consolidated memory while it is in a labile post-retrieval state.

The aim is to test this parameter in phobics, and to determine if this manipulation may be able to persistently attenuate their fear to a specific animal stimulus using a subtle modification to standard exposure therapy treatment. Participants are given a single, isolated exposure trial prior to the standard repeated exposure session to capitalize on the critical time period of the memory's labile state.

In the context of specific phobias, the fear-inducing stimulus (e.g., a spider or snake) has not necessarily ever been "paired" with an unconditioned stimulus, yet it engages brain mechanisms that overlap with those engaged during fear conditioning. The rationale in the present study is that exposure to a single fear inducing stimulus engages a number of molecular cascades (e.g., noradrenergic signaling, glutamatergic transmission) which may facilitate the updating of the individuals' interpretation of the memory

associated with the stimulus. At the same time, the previously encoded interpretation associated with this stimulus becomes labile and thus amenable to re-interpretation.

The exposure technique will utilize massed exposure (ME) for the extinction trial. ME is simple to implement with the population. Additionally, there is evidence that those receiving expanding spaced exposure (ESE) exhibit less return of fear (Rowe & Craske, 1998). Since the current study examines mechanistic changes, it is crucial that no parts of the exposure itself are primarily responsible for reduction in return of fear. Viewing reconsolidation purely without the confound of ESE would be essential to determining the efficacy of the priming variable.

Methods

Participants

Fifty-four students were recruited to participate in the study. Of this, thirty-two participants were eligible for enrollment in the study's treatment phase. Participants were recruited primarily from the Introduction to Psychology Subject Pool at the University of Texas at Austin, and through advertisements posted at various locations throughout campus. In addition, some participants referred new participants by word of mouth. To be eligible for the screening, participants had to a) be at least 18 years of age; b) not currently taking a psychoactive medication; c) have not previously received exposure treatment for their phobia, and d) have reported a score of 54 or higher on the FSQ. To be eligible for the treatment phase of the study, participants had to score a 50 or higher on both behavioral approach tests (BAT). Eligible participants ranged in age from 18-40. Of the thirty-two participants, 28 were female, and only 4 were male. Additionally, 46.8% were Caucasian, 9.3% African American, 21.8% Asian American, and 18.7% Hispanic American. One participant declined to identify their race.

Animals

Animals used in the exposure were a live American corn snake (species: Elaphe guttata guttata; body length approximately 122 cm; body width approximately 7.6 cm), African ball python (species: python regius; body length approximately 85 cm; body width approximately 12 cm), and two live Chilean Rose tarantulas (species: Grammostola Rosea; body length approximately 4 cm; body width approximately 2.5 cm). None of the

species are poisonous or venomous. Animals were cared for according to the regulations by the IACUC for animal care at the University of Texas Austin.

The American corn snake, "Bob," always functioned as the training animal for snake phobia treatment. The ball python, "Spot," was always used as the generalization animal for snake phobia treatment. The Chilean rose tarantula, "Brad," who has darker coloring, was always used as the training animal for the spider phobia treatment. The Chilean rose tarantula, "Tobey," who has lighter pinker coloring, was always used as the generalization animal for the spider phobia treatment.

Measures

Self Report Measures

Demographics: Each participant filled out a standard demographics form that asked for their age, gender, marital status, ethnicity, and years of education.

Armfield and Mattiske's Disgust Scale (Armfield and Mattiske, 1996): This test presents 8 statements about the disgust-provoking aspects of spiders and spider behavior. The subject rates each statement on a scale from 0 (strong disagreement) to 6 (strong agreement). Scores range from 0 to 48, with higher scores indicating a greater feeling of disgust towards spiders. This scale was also adapted to assess disgust towards snakes.

Spider Belief Questionnaire (SBQ): The SBQ (Arntz, Lavy, Van den Berg, & Van Rijsoort, 1993) measures the strength of various beliefs related to spiders. Subjects rate

their belief in 42 spider-related statements dealing with qualities such as unpredictability and potential to cause harm. They also rate 36 statements about their own predicted behavior, involving responses such as panic and paralysis. All ratings are on a scale from 0% (no belief at all) to 100% (complete belief). The total scores range from 0 to 100, with higher scores indicating a greater fear of spiders and of one's responses to spiders. This scale was also adapted to assess the fear of snakes.

Fear of Spider Questionnaire (FSQ): The FSQ (Szymanski & O'Donohue, 1995) focuses on current thoughts and reactions to spiders. Questions include "currently, I sometimes think about getting bit by a spider" and "I would feel very nervous if I saw a spider now." Subjects rate 18 statements about spider fear on a scale from 0 (strongly disagree) to 6 (strongly agree). The total score ranges from 0 to 108, with higher scores indicating a greater fear of spiders. This scale was also adapted to assess the fear of snakes.

Spider Phobia Questionnaire (SPQ): The SPQ (Watts & Sharrock, 1984) probes subjects' reactions to spider fear on a number of subscales: vigilance, preoccupation, avoidance-coping, and cognitive-behavioral. Questions include "do you make very sure there are no spiders around before taking a bath" (vigilance) and "are you sometimes distracted by thoughts about spiders" (preoccupation). Subjects answer 32 questions with "yes" or "no," earning one point for each "yes" response. Scores range from 0 to 32, with higher scores indicating a greater fear of spiders. This scale was also adapted to assess the fear of snakes.

The Comprehensive International Diagnostic Interview (CIDI), Version 1.0. (World Health Organization, 1990) was used to assess the psychological status of potential participants. The CIDI is a multi-module, computer-based instrument used to assist in diagnosing psychological and psychiatric disorders. In this study, only the phobia module was utilized, as it would have been too time-consuming to administer the full CIDI.

The Behavioral Approach Test (BAT) tests the subjective fear and disgust experienced by each participant to their feared stimulus. Before the approach, participants rate their expected fear and expected disgust level on a 0-100 scale. Each participant is asked to get within a 1 foot block of their feared stimulus and remain there for two minutes. Participants then rate their peak fear and peak disgust on a 0-100 scale. Participants who are unable to begin the BAT are automatically given a rating of 100 for peak fear.

Procedure

Data collection began in spring 2009 and continued through summer 2010. Pre-screening for potential participants occurred through the University of Texas at Austin's OPERA system. This large subject pool completed both the Fear of Spider and Fear of Snake Questionnaires. Eligible participants were contacted via e-mail with screening questions regarding their current psychoactive drug use and previous phobia treatment. Researchers invited eligible responders to the Phase I screening process (n=54).

During Phase I, all participants completed self-report measures. Each of these participants completed two BATs, one with the generalization stimulus and one with the training stimulus. Those who were deemed eligible based on two BAT scores of 50 or higher, were invited to Phase II of the study.

Phase II of the study included randomization, treatment, a one-day post, and a one-month follow-up. Participants were randomized to either a priming condition with exposure treatment or exposure treatment only. All participants received six three-minute exposure sessions with the training stimulus as part of their treatment in which they must remain within a one foot block of the stimulus animal's head. If the animal moved, the participant was required to move accordingly in order to maintain a constant one foot block distance. The exposure treatment was self-guided; participants were permitted to move closer the stimulus if they desired. Those randomized to pre-treatment priming received a ten second prime with the stimulus followed by a thirty minute wait, in which they answered unrelated psychological questions on the CIDI to serve as a uniform method of waiting. Those who were randomized to exposure only received an additional 10 seconds at the end of their treatment in order to receive equal exposure time. During the one-day post, participants again performed two BATs, one with the training stimulus and one with the generalization stimulus. Lastly, at the one-month follow-up, subjects again completed all screening forms and completed two BATs.

Results

Fifty-four students participated in Phase I of the study. Of these, thirty-two completed Phase II of the study. The demographic characteristics are presented in Table 1. Only four participants were men.

Independent sample t-tests revealed that there were no significant pre-treatment differences between the primed and exposure only groups in their reported levels of fear and disgust on all self-report measures and pre-treatment BATs. Treatment in both groups significantly lowered fear at one-day post, but this was expected, as exposure is an efficacious treatment for specific phobia (see Table 2). At one month follow-up, fear continued to decline and was significantly lower than at post across all groups (see Table 3). Contrary to what was initially hypothesized, at the one-month follow-up, there failed to be any significant differences in return of fear between groups.

ANOVA's were performed on the main outcomes of interests. The generalization stimulus mean peak fear was lower for the primed group, but not at a rate approaching significance ($F(1, 27)= 1.954$, $p=.174$, exposure only mean = 25.14, primed mean = 14.43). The training stimulus mean peak fear was lower for the primed group as well, but again not at a rate approaching significance ($F (1,27)=1.074$, $p=.310$ exposure only mean = 17.57, primed mean = 11.07. The study as it stands proves the null hypothesis. There was no difference between the primed and exposure only groups. This went against the prediction that the primed group would contribute to a significant alleviation of their fear at the one month follow-up. Both groups continued to maintain the gains

they had achieved through their short exposure interventions, and in fact continued to gain on the progress they had made at their one day post assessment (See Fig 1 and Fig 2).

No significant co-variants were found when controlling for phobia type, gender, or level of pre-treatment fear and disgust.

Discussion

The hypothesis that all participants would show a significant decrease in fear due to exposure therapy was supported. Exposure itself was highly effective in treating the phobias as expected. Participants showed highly significant ($p<.01$) reductions of fear at a one-day post and one-month follow-up with only eighteen minutes and ten seconds of total exposure time. Additionally, participants showed this large reduction in fear with both the generalization and training stimulus, regardless of animal fear type. Many participants spontaneously reported how happy they were about participating in the study and that they thought they had received lasting gains by participating.

However, the main hypothesis that the priming group would show significantly less return of fear than the exposure only group did not find support in the present study. This was unexpected given the strong indications from previous animal and human studies.

While the results of this pilot were not significant, it should be noted that the general fear patterns were in line with what was predicted from previous animal and human models of reconsolidation. Interestingly, the primed subjects exhibited a drop in fear at follow-up for both the training and generalization, so it is possible with the addition of more subjects, this finding may eventually become significant. Power analysis showed that 40-50 subjects would be ideal for such an analysis (See Figure 3). The addition of these 8-18 subjects may be enough to push these findings into significance or trends. Further research will be conducted that adjusts several variables,

including an increased number of participants, in order to meet the power analysis' projections.

Consistent with previous research, the majority of our eligible participants were women. Additionally no potential participants were excluded on the basis of having received previous treatment for a phobia. No effects on disgust as a treatment outcome or as co-variable for fear level were found.

Limitations

As previously stated, the power analysis (see Figure 3) indicates that the current study needs more participants in order to give an accurate test for significance. The recruitment of a larger number of subjects who are willing to participate in a study with their fear stimulus would be a good starting point. Thirteen otherwise eligible subjects from Phase I refused treatment citing their fear as a main point for not participating (See Figure 4). It is possible that the selection of subjects thus self-selected towards those who were eager and willing to get treatment and also towards those who exhibited a subjectively lower level of fear than those who refused.

The study used a non-clinical sample from the University of Texas at Austin. While the participants reported a significant fear of snakes and spiders in order to be included in the study, it is probable that they did not truly have a phobia as defined by the DSM-IV-TR. Therefore, it is possible that a floor effect on treatment occurred. Participants gained so much from the treatment there was not a high return of fear at the one month follow-up. It is possible using a more severe population we would reduce the

floor effect, and see a significant difference between the priming group and the exposure only group.

Additionally, each participant got a significant amount of exposure time, totaling eighteen minutes. Less exposure time may lessen the floor effects that treatment seemed to provide, as there is little return of fear across both groups. Future research may involve shortening exposure times in order to tease out the possible effect of priming. Exposure therapy for phobias is one of the most efficacious treatments in the field of psychology (Wolitzky, Horowitz, Powers, & Telch, 2008). In this study, the exposure therapy may have been too effective in treatment, thus resulting in complications with respect to analyzing the experimental effect.

It has been discussed that the BATs were perhaps too long and thus had an unintentional therapeutic effect. It is possible that the length of the BATs allowed the subjects to begin experiencing habituation. Shortening the BATs to thirty seconds from two minutes would help reduce this problem. Future iterations of this study will shorten the BAT so as not to provide for the beginnings of habituation. The animals used in the study were incredibly docile and nine Phase I participants did not qualify for Phase II based solely on the fact their reported fear was not high enough in these initial BATs (see Figure 4).

The study only measured subjective ratings of fear. Future revisions of this study will aim to use objective measurements, such as skin conductance readings to gain additional insight into the biological indications of a fear response. Galvanic skin

responses can be measured with relative precision. The galvanic skin response measures heightened emotions such as fear or sexual arousal (Dawson and Schell, 1990). Skin conductance readings can be gathered with relative ease and pose no risk to participants. The readings are analyzed via a computer program, thus reducing the additional costs and expenses of laboratory processing that other objective biological measures such as salivary cortisol samples would pose..

Lastly, follow-up took place only after one month due to the mobile nature of the selected population. It is possible that testing after a longer time span may reveal significant results. Human studies have previously shown a significant difference between primed and non-primed groups at a one year mark (Schiller et al, in press). Delaying follow-up to a later point in time may result in a larger differentiation between groups.

Implications for future research and intervention

The findings of the present study do not support the idea of priming as a valid method for reducing return of fear in simple animal phobias. It is possible phobia memories are too complex to be recalled in a single isolated retrieval. Previous human and animal research looked at only simple trained fears. However, this area of research should continue to be explored. Previous animal and human research both indicate that this method may still yield effective treatment options and provide further insight into the mechanistic workings of anxiety disorders. Simple and effective strategies that can augment current exposure techniques would be a valuable tool for any clinician in

practice. Since specific phobias have a high rate of reoccurrence, it is important to develop clinically valid tools that can help further treat anxiety disorders. Adjusting some of the variables from this pilot will help determine if the priming technique can be used for the larger and more nebulous specific phobias versus learned and distinct fears.

Furthermore, this research aims to examine the mechanisms of reconsolidation. Priming represents a promising way of understanding how the memory narrative can change and distort during the lability period. Developing and understanding these priming techniques would provide substantial insight into the process of reconsolidation, as well as the ability to manipulate previous memories. Combining these neuropsychological findings with clinically applicable treatments represents an important partnership across psychological domains that will allow for reconsolidation to be more fully understood.

Figures

Figure 1

Effects of the Priming Task- Training Context

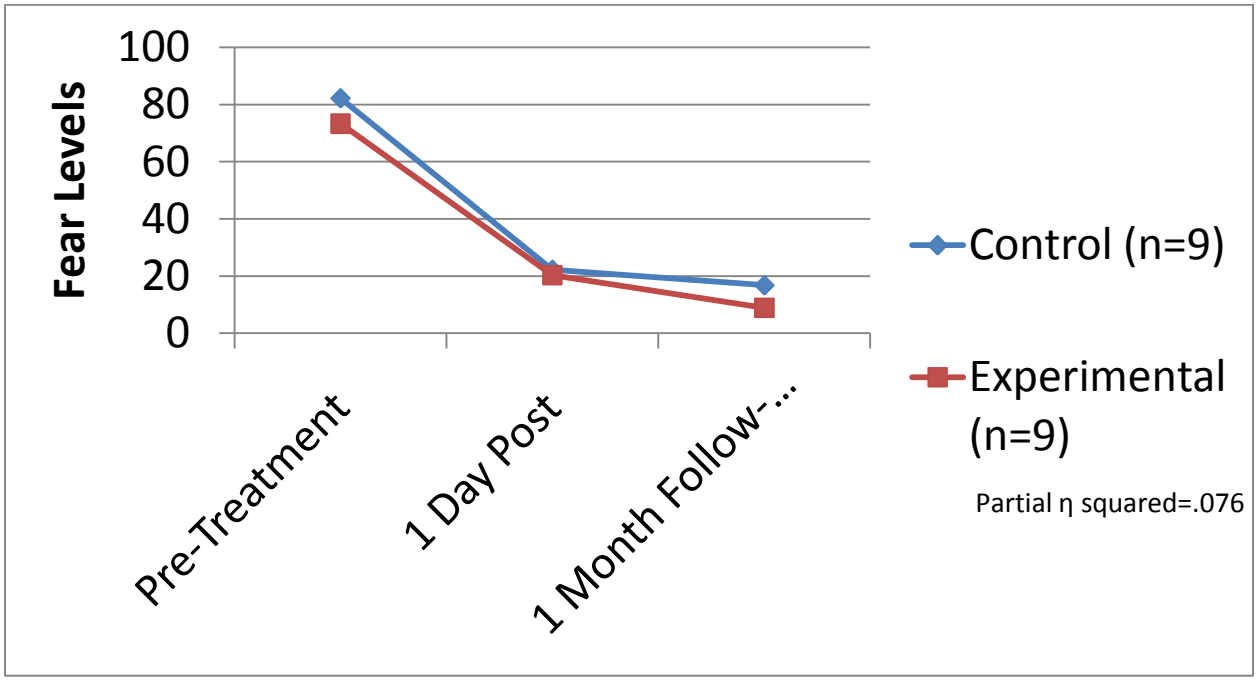


Figure 2

Effects of the Priming Task- Generalization Context

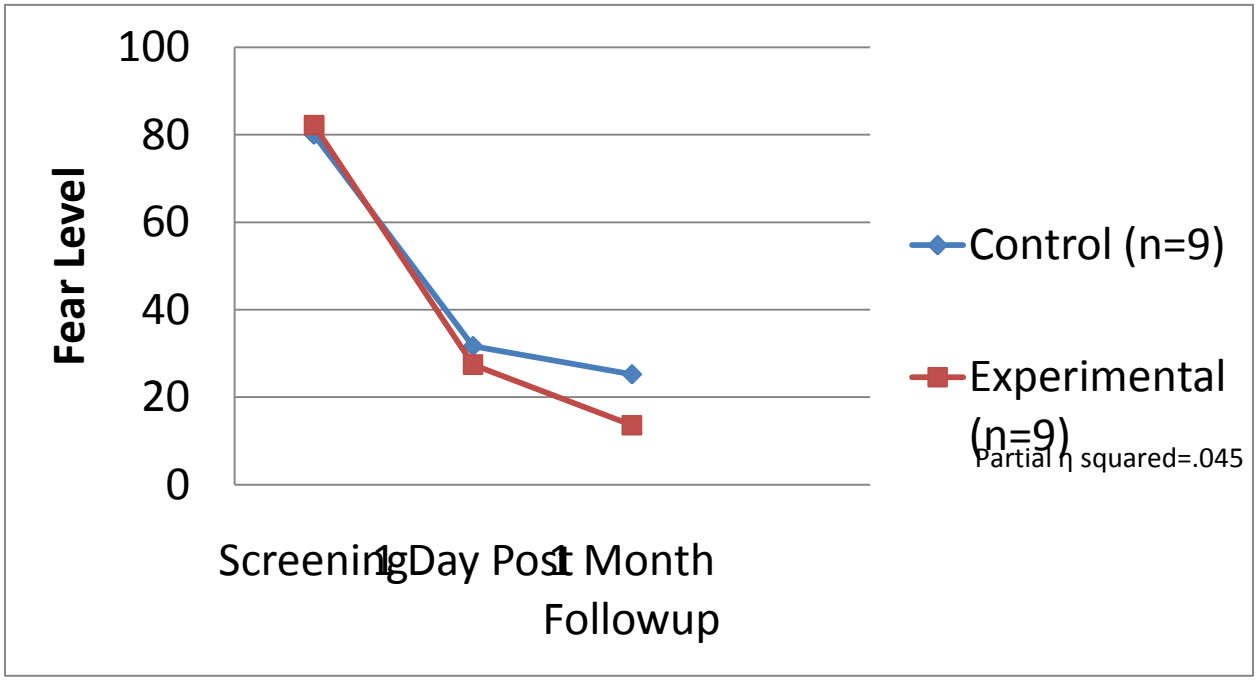


Figure 3 Power Analysis

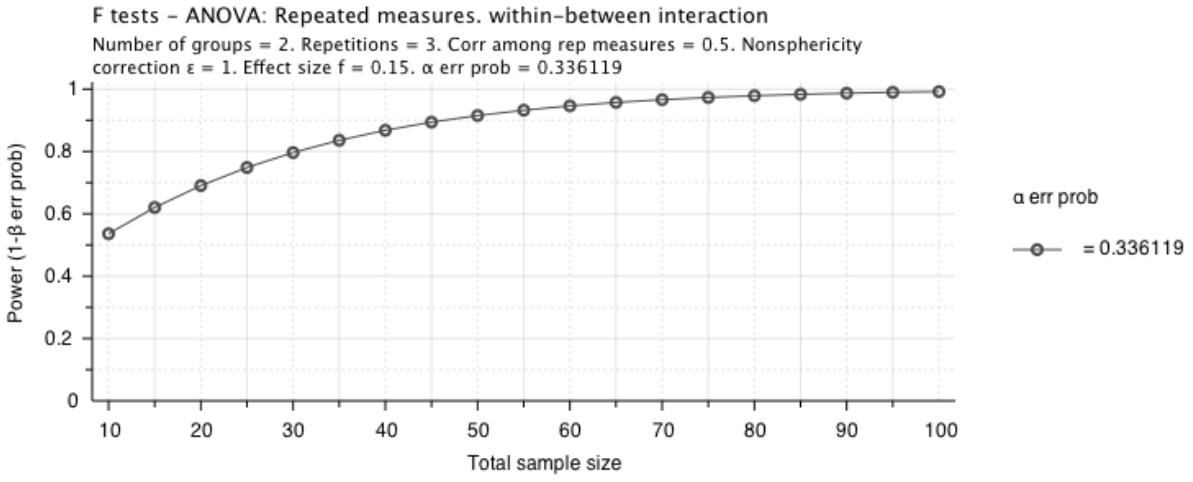
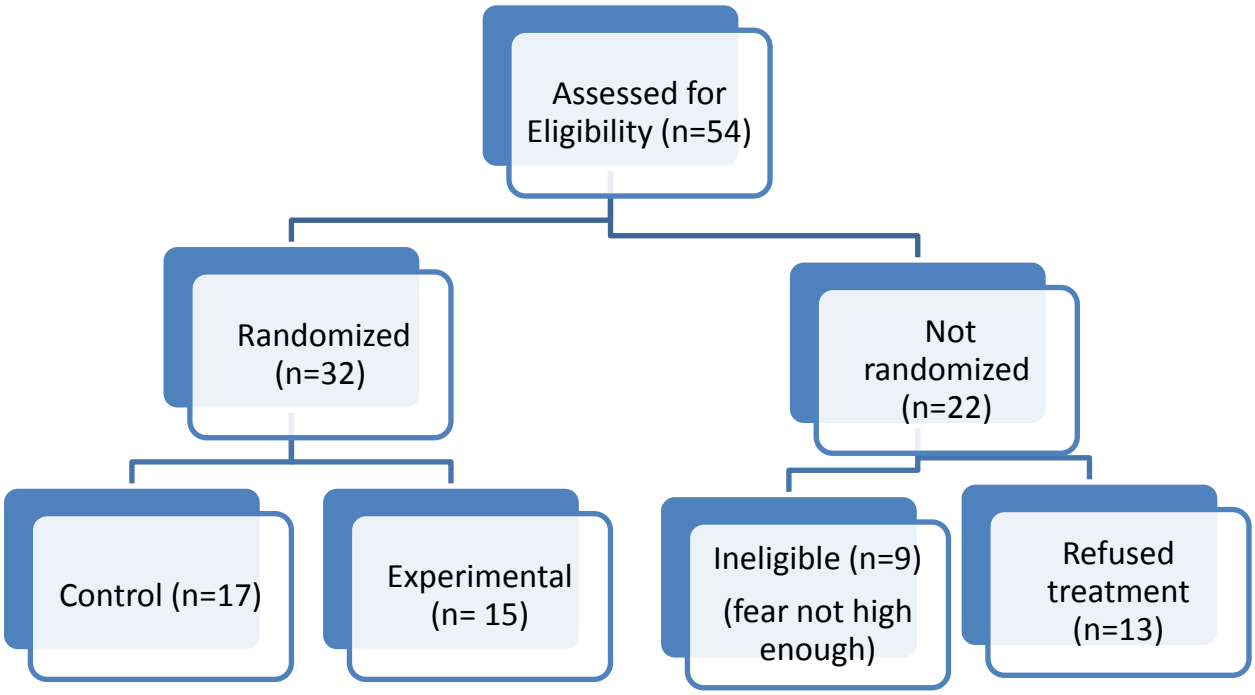


Figure 4 -Consort Guidelines



Tables

Table 1

Demographics

Ethnicity	Percentage of Participants
Caucasian	46.80%
African American	9.30%
Asian American	21.80%
Hispanic	18.70%
Refused	3.40%
	100.00%

Table 2

One sample t-tests

Group	Significance	Pre fear mean	Post fear mean
Exposure only -generalization	p< .00	82.706	28.625
Exposure only -training	p< .00	82.06	21.125
Primed group-generalization	p< .00	83	29.071
Primed group-training	p< .00	76.333	18.786

Table 3

One sample t-tests

Group	Significance	Post fear mean	Follow-up mean
Exposure only -generalization	p<.00	28.625	25.143
Exposure only-training	p<.01	21.125	17.571
Primed group-generalization	p<.01	29.071	14.429
Primed group-training	p<.03	18.786	11.071

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Vita

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